

What is claimed is:

1. A difference updating method comprising:
a difference data reception step, with a
difference data reception unit, receiving
difference data of all the segments which is
generated for each segment by dividing a new one
of two old and new files into a plurality of segments
of the same size and searching for a data row matching
10 a data row in each segment within the range from
the position which is one segment before the starting
position of a target segment of the old file to the
endmost of the old file and storing the received
difference data into a nonvolatile memory;
- 15 a restoration processing step, with a
restoration processing unit, storing the
restoration process segment number (X) indicative
of a current process segment into the nonvolatile
memory, thereafter restoring segment data from one
20 segment of the difference data and storing the
restored segment data into the nonvolatile memory;
and
an overwrite processing step, with an
overwrite processing unit, storing the overwrite
25 processing segment number (X-1) indicative of an
immediately preceding process segment into the
nonvolatile memory, thereafter reading from the

nonvolatile memory the restored data which has been restored on the immediately preceding segment and overwriting the read restored data onto data to be rewritten in a nonvolatile memory.

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2. The difference updating method according to claim 1, wherein the difference data reception step includes receiving the difference data for each segment which is generated by searching for a data 10 row matching a data row in each segment within the range from the starting position of a target segment of the old file to the endmost of the old file.

3. The difference updating method according to 15 claim 1, further comprising:

a decision step, with a decision unit, deciding whether the power supply is interrupted during the restoration process of the segment data or the power supply is interrupted during the overwriting process 20 of the segment data, after the power supply is recovered in the case of power interruption;

a restoration resume step, with a restoration resume unit, resuming the restoration process from the head of the segment of the restoration process 25 segment number read from the nonvolatile memory after the power recovery in the case where the power supply has been interrupted during the restoration

process of the segment data; and
an overwriting resume step, with an
overwriting resume unit, resuming the overwriting
process from the head of the overwrite processing
5 segment number read from the nonvolatile memory
after the power recovery in the case where the power
supply has been interrupted during the overwriting
process of the segment data.

10 4. The difference updating method according to
claim 3, wherein the decision step includes
calculating a difference between the restoration
process segment number and the overwrite processing
segment number after the power supply is recovered
15 in the case of the power interruption, deciding that
the power supply was interrupted during the
restoration process if the difference is 1, and
deciding that the power supply was interrupted
during the overwriting process if the difference
20 is 2.

5. The difference updating method according to
claim 1, wherein the restoration processing step
includes deciding whether the content of the
25 restored segment data which is restored from one
segment of the difference data and the content of
the corresponding segment data of the data to be

written are identical or not, and, if these are identical, describing into the nonvolatile memory that the old and the new are identical, instead of the restored segment data; and wherein

5 the overwrite processing step includes skipping the overwriting of the restored segment data if it is described in the nonvolatile memory that the old and the new are identical.

10 6. The difference updating method according to claim 1, wherein the restoration processing step further includes equally dividing the restored segment data which is restored from one segment of the difference data into n pieces of restored
15 block data, deciding whether the restored block data and the rewrite data are identical or not for each block, and, if these are identical, describing into the nonvolatile memory that the old and the new are identical, instead of the restored block data; and
20 wherein

 the overwrite processing step includes skipping the overwriting of the restored block data if it is described in the nonvolatile memory that the old and the new are identical.

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7. A difference updating method comprising:
 a difference data reception step, with a

difference data reception unit, generating difference data for each segment by dividing a new one of two old and new files into a plurality of segments of the same size and searching for a data row matching a data row in each segment within the range from the position which is one segment before the starting position of a target segment of the old file to the endmost of the old file, as well as equally dividing one segment of the old and new data into n blocks, deciding whether the block data of new file and the block data of old file are identical or not on a block-to-block basis, and, if these are identical, describing that the old and the new are identical into the difference data, instead of the difference block data, receiving the difference data of all the segments which has the description and storing the received difference data into a nonvolatile memory;

a restoration processing step, with a restoration processing unit, storing the restoration process segment number (X) indicative of a current process segment into the nonvolatile memory, thereafter restoring the block data which is divided into n pieces per one segment of the difference data and storing the restored block data into the nonvolatile memory; and

an overwrite processing step, with an

overwrite processing unit, storing the overwrite processing segment number (X-1) indicative of an immediately preceding process segment into the nonvolatile memory, thereafter reading from the
5 nonvolatile memory the restored block data which is divided into n pieces per restored data which is restored on the immediately preceding segment and overwriting the read restored block data onto the data to be written in the nonvolatile memory.

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8. The difference updating method according to claim 7, further comprising:

a decision step, with a decision unit, deciding whether the power supply is interrupted during the
15 restoration process of the segment data or the power supply is interrupted during the overwriting process of the segment data, after the power supply is recovered in the case of power interruption;

a restoration resume step, with a restoration resume unit, resuming the restoration process from the head of the segment of the restoration process segment number read from the nonvolatile memory after the power recovery in the case where the power supply has been interrupted during the restoration
25 process of the segment data; and

an overwriting resume step, with an overwriting resume unit, resuming the overwriting

process from the head of the overwrite processing segment number read from the nonvolatile memory after the power recovery in the case where the power supply has been interrupted during the overwriting process of the segment data.

9. The difference updating method according to claim 7, wherein
the restoration processing step includes
10 skipping the restoration process based on the difference block data and describing in the nonvolatile memory that the old and the new are identical, if it is described in the difference block data that the old and the new are identical, and
15 wherein

the overwrite processing step includes
skipping the overwriting of the restored block data, if it is described in the nonvolatile memory that the old and the new are identical.

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10. A program allowing a computer to execute:
a difference data reception step receiving
difference data of all the segments which is
generated for each segment by dividing a new one
25 of two old and new files into a plurality of segments
of the same size and searching for a data row matching
a data row in each segment within the range from

the position which is one segment before the starting position of a target segment of the old file to the endmost of the old file and storing the received difference data into a nonvolatile memory;

5 a restoration processing step storing the restoration process segment number (X) indicative of a current process segment into the nonvolatile memory, thereafter restoring segment data from one segment of the difference data and storing the
10 restored segment data into the nonvolatile memory;
and

an overwrite processing step storing the overwrite processing segment number (X-1) indicative of an immediately preceding process
15 segment into the nonvolatile memory, thereafter reading from the nonvolatile memory the restored data which has been restored on the immediately preceding segment and overwriting the read restored data onto data to be rewritten in the nonvolatile
20 memory.

11. The program according to claim 10, wherein the difference data reception step includes receiving the difference data for each segment which is
25 generated by searching for a data row matching a data row in each segment within the range from the starting position of a target segment of the old

file to the endmost of the old file.

12. The program according to claim 10, further comprising:

5 a decision step deciding whether the power supply is interrupted during the restoration process of the segment data or the power supply is interrupted during the overwriting process of the segment data, after the power supply is recovered in the case of power interruption;

10 a restoration resume step resuming the restoration process from the head of the segment of the restoration process segment number read from the nonvolatile memory after the power recovery in the case where the power supply has been interrupted
15 during the restoration process of the segment data;
and

an overwriting resume step resuming the overwriting process from the head of the overwrite processing segment number read from the nonvolatile memory after the power recovery in the case where the power supply has been interrupted during the overwriting process of the segment data.

13. The program according to claim 12, wherein the
25 decision step includes calculating a difference between the restoration process segment number and the overwrite processing segment number after the

power supply is recovered in the case of the power interruption, deciding that the power supply was interrupted during the restoration process if the difference is 1, and deciding that the power supply
5 was interrupted during the overwriting process if the difference is 2.

14. The program according to claim 10, wherein the restoration processing step includes deciding
10 whether the content of the restored segment data which is restored from one segment of the difference data and the content of the corresponding segment data of the data to be written are identical or not, and, if these are identical, describing into the
15 nonvolatile memory that the old and the new are identical, instead of the restored segment data; and wherein

the overwrite processing step includes skipping the overwriting of the restored segment data if it is described in the nonvolatile memory that the old and the new are identical.
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15. The program according to claim 10, wherein the restoration processing step further includes
25 equally dividing the restored segment data which is restored from one segment of the difference data into n pieces of restored block data, deciding

whether the restored block data and the rewrite data are identical or not for each block, and, if these are identical, describing into the nonvolatile memory that the old and the new are identical, instead 5 of the restored block data; and wherein

the overwrite processing step includes skipping the overwriting of the restored block data if it is described in the nonvolatile memory that the old and the new are identical.

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16. A program allowing a computer to execute: a difference data reception step generating difference data for each segment by dividing a new one of two old and new files into a plurality of 15 segments of the same size and searching for a data row matching a data row in each segment within the range from the position which is one segment before the starting position of a target segment of the old file to the endmost of the old file, as well 20 as equally dividing one segment of the old and new data into n blocks, deciding whether the block data of new file and the block data of old file are identical or not on a block-to-block basis, and, if these are identical, describing that the old and 25 the new are identical into the difference data, instead of the difference block data, receiving the difference data of all the segments which has the

description and storing the received difference data into a nonvolatile memory;

a restoration processing step storing the restoration process segment number (X) indicative of a current process segment into the nonvolatile memory, thereafter restoring the block data which is divided into n pieces per one segment of the difference data and storing the restored block data into the nonvolatile memory; and

10 an overwrite processing step storing the overwrite processing segment number (X-1) indicative of an immediately preceding process segment into the nonvolatile memory, thereafter reading from the nonvolatile memory the restored 15 block data which is divided into n pieces per restored data which is restored on the immediately preceding segment and overwriting the read restored block data onto the data to be written in the nonvolatile memory.

20 17. The program according to claim 16, wherein the difference data reception step includes receiving the difference data for each segment which is generated by searching for a data row matching a data row in each segment within the range from the 25 starting position of a target segment of the old file to the endmost of the old file.

18. The program according to claim 16, further comprising:

a decision step deciding whether the power supply is interrupted during the restoration process of the segment data or the power supply is interrupted during the overwriting process of the segment data, after the power supply is recovered in the case of power interruption;

10 a restoration resume step resuming the restoration process from the head of the segment of the restoration process segment number read from the nonvolatile memory after the power recovery in the case where the power supply has been interrupted during the restoration process of the segment data;

15 and

an overwriting resume step resuming the overwriting process from the head of the overwrite processing segment number read from the nonvolatile memory after the power recovery in the case where
20 the power supply has been interrupted during the overwriting process of the segment data.

19. The program according to claim 18, wherein the decision step includes calculating a difference between the restoration process segment number and the overwrite processing segment number after the power supply is recovered in the case of the power

interruption, deciding that the power supply was interrupted during the restoration process if the difference is 1, and deciding that the power supply was interrupted during the overwriting process if
5 the difference is 2.

20. The program according to claim 16, wherein
the restoration resume step includes skipping
the restoration process based on the difference
10 block data and describing in the nonvolatile memory
that the old and the new are identical, if it is
described in the difference block data that the old
and the new are identical, and wherein
the overwrite processing step includes
15 skipping the overwriting of the restored block data,
if it is described in the nonvolatile memory that
the old and the new are identical.

21. A difference updating apparatus comprising:
20 a difference data reception unit for receiving
difference data of all the segments which is
generated for each segment by dividing a new one
of two old and new files into a plurality of segments
of the same size and searching for a data row matching
25 a data row in each segment within the range from
the position which is one segment before the starting
position of a target segment of the old file to the

endmost of the old file and storing the received difference data into a nonvolatile memory;

5 a restoration processing unit for storing the restoration process segment number (X) indicative of a current process segment into the nonvolatile memory, thereafter restoring segment data from one segment of the difference data and storing the restored segment data into the nonvolatile memory;

10 an overwrite processing unit for storing the 10 overwrite processing segment number (X-1) indicative of an immediately preceding process segment into the nonvolatile memory, thereafter reading from the nonvolatile memory the restored data which has been restored on the immediately preceding segment and overwriting the read restored data onto data to be rewritten in the nonvolatile memory;

15 a decision unit for deciding whether the power supply is interrupted during the restoration process of the segment data or the power supply is interrupted during the overwriting process of the segment data, after the power supply is recovered in the case of power interruption;

20 a restoration resume unit for resuming the restoration process from the head of the segment of the restoration process segment number read from the nonvolatile memory after the power recovery in

the case where the power supply has been interrupted during the restoration process of the segment data; and

an overwriting resume unit for resuming the
5 overwriting process from the head of the overwrite processing segment number read from the nonvolatile memory after the power recovery in the case where the power supply has been interrupted during the overwriting process of the segment data.

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22. A difference updating apparatus comprising:
a difference data reception unit for generating difference data for each segment by dividing a new one of two old and new files into a plurality of
15 segments of the same size and searching for a data row matching a data row in each segment within the range from the position which is one segment before the starting position of a target segment of the old file to the endmost of the old file, as well
20 as equally dividing one segment of the old and new data into n blocks, deciding whether the block data of new file and the block data of old file are identical or not on a block-to-block basis, and, if these are identical, describing that the old and
25 the new are identical into the difference data, instead of the difference block data, receiving the difference data of all the segments which has the

description and storing the received difference data into a nonvolatile memory;

5 a restoration processing unit for storing the restoration process segment number (X) indicative of a current process segment into the nonvolatile memory, thereafter restoring the block data which is divided into n pieces per one segment of the difference data and storing the restored block data into the nonvolatile memory;

10 an overwrite processing unit for storing the overwrite processing segment number (X-1) indicative of an immediately preceding process segment into the nonvolatile memory, thereafter reading from the nonvolatile memory the restored 15 block data which is divided into n pieces per restored data which is restored on the immediately preceding segment and overwriting the read restored block data onto the data to be written in the nonvolatile memory;

20 a decision unit for deciding whether the power supply is interrupted during the restoration process of the segment data or the power supply is interrupted during the overwriting process of the segment data, after the power supply is recovered in the case of power interruption;

25 a restoration resume unit for resuming the restoration process from the head of the segment of the restoration process segment number read from

the nonvolatile memory after the power recovery in
the case where the power supply has been interrupted
during the restoration process of the segment data;
and

- 5 an overwriting resume unit for resuming the
 overwriting process from the head of the overwrite
 processing segment number read from the nonvolatile
 memory after the power recovery in the case where
 the power supply has been interrupted during the
10 overwriting process of the segment data.